

Remarks

Claims 1-20 and 31-60 are in the application, of which claims 1, 32, 39, and 55 are in independent form. Claims 21-30 are canceled, and new claims 39-60 are added by this amendment.

The Examiner acknowledges applicant's paper 6 election of the Group I claims, and makes the restriction requirement final. Applicants respond by canceling claims 21-30.

The Examiner states that the title of the invention is not descriptive. Applicants respond by amending the title to read, **--LIQUID-CRYSTAL-BASED VIDEO PROJECTION SYSTEM HAVING HIGH-RESOLUTION, HIGH CONTRAST, AND LONG LIFE--**.

Claim 18 is objected to for informalities. The Examiner states that the claim becomes unclear if there is only one arc lamp (as in amended claim 17). Applicants respond by amending claim 18 to recite "...a fold mirror associated with each of the 1, 2, 3, or 4 arc lamps to form a substantially collimated light bundle" and by amending claim 19 to recite "...the light source includes more than 1 arc lamp, and the fold mirrors form a pinwheel-shaped mirror configuration."

Applicants have amended application paragraphs [0060] and [0073] of the application and claim 15 to correctly state well-known physical principles underlying the operation of the Fresnel lens used in the present invention. Specifically, applicants have replaced "diffraction" with --refraction--. Support for the reference to refraction in describing the bending of light rays by the Fresnel lens can be found in Exhibit A (attached). Exhibit A is a set of copies of pages 29, 45, and 97 of THE PHOTONICS DICTIONARY, 1986, Book 3, 32nd Edition, Laurin Publishing Company, Inc., Pittsfield, MA 01202. Pages 29, 45, and 97 present definition of diffraction, Fresnel lens, and refraction, respectively.

Claims 32-38 stand rejected under 35 U.S.C. §112, ¶2 for indefiniteness. The Examiner states that claim 32 recites, "the effective source size being very small relative to the panel size", which is an ill-defined relative comparison. For examining purposes, the Examiner assumes that 1:50 is required, as for claim 1. Applicants respond by amending claim 32 to recite, "the effective source size being two percent or less of the panel size...."

Claim 7 stands rejected under 35 U.S.C. §112, ¶2 for indefiniteness. The Examiner states that the term "optical element" is not defined sufficiently to make the scope of this claim clear. Applicants respond by amending claim 7 to recite, "optical lens elements."

Claim 16 stands rejected under 35 U.S.C. §112, ¶2 for indefiniteness. The Examiner states that the phrase "a cone angle that is less than about ± 6 degrees" is unclear. Applicants respond by amending claim 16 to recite, "... light rays that propagate through the LCD panel

at a divergence angle that is less than about ± 6 degrees relative to the angle of incidence of the polychromatic principal ray.”

Claims 1-3, 17, and 31 stand rejected under 35 U.S.C. §102(b) for anticipation by U.S. Pat. No. 5,623,349 (“Clarke”). The Examiner states that Clarke describes an image projection apparatus comprising an arc lamp light source having a 1 mm effective source size that is two percent or less than the 75 mm LCD panel diagonal dimension. Applicants respond by amending claim 1 to recite,

“... a liquid crystal display (LCD) panel adapted to form a light pattern in response to the incident polychromatic light rays and applied signals carrying light pattern information; and
an optical lens device positioned to receive and having optical light directing properties to steer the principal light ray and associated bundle of polychromatic light rays for incidence on the LCD panel at substantially the same angle that contributes to formation of the light pattern at a contrast ratio of at least 1000:1.”

Support for this amendment is found at application page 15, ¶ 0056 that describes a metal halide arc lamp, which provides white polychromatic light. Applicants note that Clarke employs angularly separated RGB light bundles that propagate through a microlens array that directs the bundles at differing angles of incidence to respective RGB pixels in the LCD panel (see Clarke Fig. 2 and col. 4, lines 37-46). Clarke’s apparatus is optimized for brightness and color purity but cannot achieve an optimum contrast ratio because of the differing angles of incidence employed (displays such as Clarke’s typically achieve a contrast ratio of less than 500:1). In contrast, applicants’ claimed invention achieves a contrast ratio greater than 1,000:1 at the cost of brightness and viewing angle from the LCD panel (the viewing angle is restored by the projection screen without sacrificing contrast ratio, and high brightness is achieved by employing the claimed multi-lamp, high intensity light source). Applicants believe that amended claim 1 and its dependent claims 2, 3, 17, and 31 are not anticipated by Clarke and request, therefore, that this rejection be withdrawn.

Claims 9, 10, 32, and 36 stand rejected under 35 U.S.C. §103(a) for obviousness over Clarke as applied to claim 1 above. Claims 9 and 10 depend on independent claim 1. Claim 32 is independent, and claim 36 depends on claim 32. The Examiner states that Clarke also describes an LCD panel receiving a light bundle including a principal light ray that is set at an angle of incidence on the LCD panel to achieve an improved contrast ratio but is silent on the actual contrast ratio of the device. The Examiner states that having a high contrast ratio, such as 1,000:1, is a well-known goal in the LCD art. Applicants respond by amending claim 32 to recite polychromatic light for the same reasons as set forth in support of amended claim

1 above. To reiterate, applicants believe that amended claim 32 and claims 9, 10, and 36 would not have been obvious because Clarke employs angularly separated RGB light bundles that propagate through a microlens array that directs the bundles at differing angles of incidence to respective RGB pixels in the LCD panel. Clarke's apparatus is optimized for brightness and color purity but cannot achieve an optimum contrast ratio because of the differing angles of incidence employed. Displays such as Clarke's typically achieve a contrast ratio of less than 500:1, whereas applicants' claimed invention achieves a contrast ratio greater than 1,000:1. Applicants submit that no combination of teachings from Clarke could result in the claimed invention and request, therefore, that this rejection be withdrawn.

Claim 8 stands rejected under 35 U.S.C. §103(a) for obviousness over Clarke as applied to claim 1 above, in view of U.S. Pat. No. 5,710,609 ("Shimada"); claims 1-7, 11, and 16 stand rejected under 35 U.S.C. §103(a) for obviousness over U.S. Pat. No. 5,758,940 ("Ogino") in view of U.S. Pat. No. 5,135,300 ("Toide et al."); claims 17-19 and 33-35 stand rejected under 35 U.S.C. §103(a) for obviousness over Clarke as applied to claims 1 and 32 above in view of U.S. Pat. No. 6,545,814 ("Bartlett et al."); and claims 32, 36, and 37 stand rejected under 35 U.S.C. §103(a) for obviousness over Ogino in view of Toide et al.

Applicants believe that claims 1-8, 11, 16, 17-19, and 32-37 are allowable for the reasons set forth above in support of amended independent claims 1 and 32. Moreover, applicants submit that no combinations of teachings from the cited references could result in the claimed invention and request, therefore, that these rejections be withdrawn.


Claims 12-15 and 20 are objected to as being dependent upon a rejected base claim. The Examiner states that they would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants respond by adding new independent claim 39, which recites the subject matter of claims 1 and 12, and adding dependent claims 40-54.

The Examiner states that claim 38 would be allowable if rewritten to overcome the above-described 35 U.S.C. §112, ¶ 2 rejection and to include all of the limitations of base claim 32 and any intervening claims. Applicants respond by adding new independent claim 55, which recites the subject matter of claims 32 and 38, and adding dependent claims 56-60.

Applicants believe their application is in condition for allowance and respectfully request the same.

Respectfully submitted,

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